

Instructions for No. 51 Flywheel Balance Kit



Rev C 9-19-26



INTRODUCTION

The No. 51 Flywheel Balance Kit is designed to allow the engine builder to statically balance each flywheel separately in Harley-Davidson® engines. The static method of balancing uses gravity to cause the heaviest part of the flywheel to rotate downward when placed on the balance stand. Weight is then removed from the heavy side by drilling holes. When the flywheel no longer rotates, it is properly balanced.

Balancing is important!! But it's not everything. If a rider is experiencing excessive vibration, usually it's due to other factors. Some of these factors include: damaged or loose engine mounts, rigidly mounted handlebars, primary drive components like compensators and clutch baskets, etc. But the shaking can definitely also be related to the flywheels. And even if they are balanced correctly, excessive vibration can still take place if the flywheels weren't properly trued.

When balancing flywheels, you need to consider both the rotating parts (like the crank pin and rod bearings), as well as the reciprocating parts (like the pistons and rings). But what about the connecting rods? Good question! The top part of the rods are going up and down (reciprocating), while the bottom part of the rods are going round and round (rotating). So the rods are the "in between" parts that are both rotating and reciprocating. For this reason, we need to weigh both ends of the rods. This is done by simply holding the rod horizontally (with the centerline of the rod level), while supporting one side and weighing the other side. Then repeating the process and weighing the opposite side.



The balance factor used on most 1936-1999 Harley and aftermarket engines is 60%. This has historically been a good value for most engine architectures and riding styles. If you change the balance factor, you're really just changing the direction of the vibration vector. Balance factors lower than 60% will tend to vibrate more vertically, while balance factors higher than 60% will tend to vibrate more horizontally. 60% is a good value to use on most engines. With streetable motors, some engine builders go as low as 57-58%, usually on rubber mounted engines. Some argue that a higher balance factor such as 62-63% is better for a rigidly mounted motor. Because it's harder to feel the forward and backward vibration, and due to having a long wheelbase and heavy tires, some people think this can be more comfortable at freeway speeds on a hardtail. But 60% is a good all-around balance factor. So if you're not sure, just stick with that.

The No. 51 Balance Kit comes with a tray that includes the balance shaft, nut, and all adapters as shown below.



Shims included:

- (2 pc) 0.005 thickness
- (2 pc) 0.010 thickness
- (2 pc) 0.015 thickness
- (3 pc) 0.025 thickness
- (3 pc) 0.100 thickness
- (2 pc) 0.180 thickness

And lastly, the Layout Tool and a 12 g magnet



HOW TO USE THIS KIT:

See the entire video series we've made on rebuilding flywheels. There is a lot of detail in these videos, including a few tips that may not be mentioned in these instructions.

Step 1) Have all the ACTUAL parts the engine will be running. This must include the new pistons, wrist pins, and rings. Weigh actual parts unless you're extremely confident you're using good weight values for substituted parts. All weights should be accurate within 1g.



Step 2) Follow the worksheet at the end of these instructions and fill it out with all the appropriate part weights. See the filled-out example of this form to help understand it better.

In the old days, it would have required an expensive triple beam scale to accurately weigh all these parts. It was a painstakingly slow process. But now you can buy a digital kitchen scale for under \$20 that is much faster to use, and is extremely accurate. You need a scale that is accurate to about 1 gram, and has at least a 1gram to 1450 gram range.

Step 3) After weighing everything and following the worksheet, you will have then calculated the actual bobweight value you need to put on each flywheel. The next step is to put the bobweight parts and shims onto the scale and remove/add shims until you achieve this weight.



Step 4) Put the correct taper adapter onto the balance shaft and run the shaft through the center hole of the flywheel half and

tighten the nut to secure the flywheel to the balance shaft.



Step 5) Put the flywheel on the rolling balance stand, and hand tighten the bobweight into the crank pin hole of the flywheel.



Step 6) Determine initial heavy spot on the flywheel, where weight will need to be removed. Place the layout tool in this area and mark several holes



Center punch these holes and start to drill them until the flywheel is in balance. Start drilling from the center of the hole pattern you laid out, and work outward. Stop frequently to put the flywheel back on the balance stand and see if you're getting closer. When you're within about 20 grams, you really want to go slow and drill only $\frac{1}{4}$ " deep at a time, in between checks on the balance stand.

When perfectly balanced, the flywheel will no longer rotate on the balance stand. The Fast Eddy Co. No. 51 balance kit should be accurate to within about 2-3 grams. For most engine building applications, this is much higher accuracy than what is actually required. On a typical engine build, as long as you can get them within 12 grams, this is sufficient. But take your time and shoot for under 5 grams or better. We believe it is more important to balance each of the two flywheel halves to the same weight, than it is to balance them to the original calculated bobweight value. In other words, make sure both flywheel halves are balanced to the same bobweight value.

There is a magnet included with this kit that weighs 12 g. When you add this magnet to the opposite side of the flywheel, that's exactly the same as removing 12 grams from the side you need to drill. This is a fast way to understand whether you're in the ballpark, and you can fine tune it from there. 12 grams is exactly the same as drilling a $\frac{7}{16}$ hole to a depth of $\frac{3}{4}$ " (depth measured from the drill bit first contacting the flywheel). So having the

magnet on one end of the flywheel is the **almost exactly the same** as drilling a $\frac{3}{4}$ deep hole on the opposite side. So, if you put the magnet on the light spot and then it becomes the heavy spot and rotates downward, then you know you're within 12 grams. And therefore you know the **most** you still have to drill would be one $\frac{3}{4}$ " deep hole (or less).



Once the flywheel half is balanced, install the balance shaft and bobweight onto the other flywheel and repeat the previous steps.

GENERAL TIPS FOR USING THIS KIT:

Tips for weighing rods:

- When weighing rods, it's important that the rods be level, and that you weigh things multiple times so that you're confident in the values. Maybe a slight height adjustment is made to the rod weighing stand

between measurements, or you flip the rod over and see if the value changes. Establish your best average values.

- The balance sheet you fill out has a value for the wrist pin end of each rod, as well as the crank pin end of each rod. To get these two values to add up to the actual total weight of the rod, it's usually best to take several measurements. For example sake with nice round numbers, say the wrist pin end of the rod weighs 200g, and the crank pin end of the rod weighs 300g. But when you weigh the entire rod, the actual weight is 505g. You can then make minor adjustments to the values so that they add up to the actual total. In this example, we might adjust the wrist pin end of the rod to be 202g and the crank pin end to be 303g, so that they add up to the actual total of 505g.

Tips for drilling holes and balancing:

- Put bobweight in flywheel and put it on the balance stand to find the initial heavy spot from which you need to remove weight.
- Use the Fast Eddy Co. curved layout jig to lay out and evenly space several holes in this area. Center punch all the holes, even if you don't plan on needing to drill that many. This will save time so you don't have to lay out more holes as you need them. This is especially convenient

when using brand new aftermarket flywheels, such as those from S&S or from Truett & Osborn, especially if you are using light weight OEM rods, you will find you need to drill quite a few holes to get these flywheels into the proper balance.

- You can remove the center shaft and bobweight from the flywheel each time you go back to the drill press to drill a hole. This is fine, but takes a little more time. You may figure out a way to fashion a support for the flywheel and set up your drill press or milling machine in a way that you can drill these holes WITHOUT removing the balance shaft and bobweight from the flywheel. This is a huge time saver because you can quickly go back and forth from the balance stand and the drill press, checking the balance as you go. But this requires caution- ensure you're drilling in a safe way and that the holes you're drilling are perpendicular and correctly located on the flywheel.
- Generally the holes in knuckle, pan, and shovel flywheels (which were static balanced in the same way from the factory), are drilled on the inside face of the flywheel (the side that the crank pin sticks out of). Evos and some aftermarket cranks have holes drilled on the outside. This is generally because those flywheels were dynamically balanced after assembly.

- Usually the heavy spot is at the bottom of the flywheel and you simply have to drill a few holes and bring the flywheel into balance.
- If the heavy spot is at the top of the flywheel (near the crank pin), you weren't as lucky. In this case, you have two options:
 - Option 1) you can fill existing balance holes at the bottom. If the original holes were drilled with a 7/16 drill bit as was done from the factory, this is usually accomplished by running a ½-20 tap into the hole, and then threading a bolt or a short piece of ½-20 all-thread into the hole and then cutting off the excess and machining it or grinding it flush afterward. If you clean the hole after tapping and use red Loctite 272 when you install the bolt (or all-thread), it will never come out. And if you require more confidence, you can always distort the top one or two of the uppermost threads of the all-thread, or use a center punch around the perimeter of the all-thread and the flywheel after machining it flush. Welding is not generally an option, as all original pre-evo flywheels are made from ductile iron, not steel. However, brazing is sometimes an option. Most people use the tap and ½-20 bolt method. This is simple and extremely reliable.
 - Option 2) You can remove material from the top of the flywheel near

the crank pin. This should be done with extreme caution and holes should never be drilled too close to the crank pin. When this is done, it is typically done with smaller diameter holes along the rim, or by milling away this section of the flywheels (SHOW PIC OF MILLING EDGES OF RIM), or by drilling large diameter shallow holes radially on the outside rim of the flywheel, with the holes pointing toward the center of the flywheel.

- Option 1 is usually considered best practice before resorting to removing additional material near the crank pin.

Balance Hole Examples:

The two flywheels shown below were likely balanced at the factory and never rebalanced. There are just a couple of balance holes and all the holes are 7/16 diameter and located near the bottom of the rim



The flywheel shown below has probably been rebalanced once or twice, and is typical of a “decent” flywheel you might find at a swap meet. Note that the thrust washer area is also decent. Although it needs to be replaced, there are only the 4 original flat factory punch marks that keep the washer in place.



But don't be the guy shown below.... There are holes all over the place, all around the rim of the wheel. Holes should first be filled on the light side, instead of just drilling a lot more holes on the heavy side. And drilling too many holes close to the crank pin should be avoided. Also the hole diameters on the rim should all be 7/16" diameter, not larger as some of these holes appear to be.



WHAT'S NEXT?

After both flywheel halves are balanced and all the appropriate parts (either new or rebuilt) are present, you are ready to assemble the flywheels. See our video series for more information on how to assemble and true flywheels. It is imperative to follow all appropriate assembly steps and torque values. The Fast Eddy Co. Torque Chart is a great additional shop aid.

ADDITIONAL NOTES about assembling and truing flywheels:

1) Always true the shafts to the individual wheels before trying to true the assembly. It's often impossible to true the assembly without following this step first. With one flywheel in the truing stand (with centers on each end of the shaft), the lateral indicated runout on the flywheel near the outer rim should be less than .002" at the very most.

2) Opinions vary on this, but in our experience, it is best to only tighten the crank pin nuts once to their full torque value, and true the flywheels just once, rather than tightening each crank pin nut incrementally and truing the flywheels each time. Just do it once, because every time you tighten the crank pin nuts, the whole thing will go out of true and it's like you're starting over.

Rebuilding a crank properly will result in a bottom end that lasts many, many years. Take your time, do it right, and use high-quality parts.

AND WHAT ABOUT EVOS?

The basic No. 51 balance kit will allow you to balance just about every H-D and aftermarket flywheel, where the pinion or sprocket shaft is a separate piece from the wheel. This way the balance shaft from the basic kit can be installed through the center of the flywheel, and the flywheel can be placed in the center of the rolling balance stand. Starting in 1985, some OEM flywheels changed so that the pinion and/or sprocket shaft was actually forged into the flywheel as a single piece. This means, it's not possible to remove the sprocket shaft from the flywheel and put the flywheel on the balance stand in the same way.

Additional balance kits are available from Fast Eddy Co. that allow you to balance these flywheels. They use an adapter that threads onto the flywheel and a long counterweight, allowing the flywheel to be off to one side of the balance stand, rather than being in the center between the rollers. These flywheels would then be balanced the same way as the flywheels mentioned in this kit, just with the flywheel hanging off the side of the balance stand instead of being in the center.

Fast Eddy Co. makes a kit for Evo Big Twin models, as well as a kit for Evo Sportster models. Each of these kits contain the appropriate adapters for those engines/flywheels. The kits both work with the same single counterweight, which the user would be required to purchase separately.



FLYWHEEL BALANCE SHEET

(WEIGHTS IN GRAMS)



OWNER'S NAME: Spider

DATE: 8-31-2026

ENGINE INFO

YEAR & TYPE OF ENGINE <u>1945 FL</u>		PISTON TYPE: <u>Wiseco 8.5:1</u>
BORE <u>3-7/16 std</u>	STROKE <u>3-31/32, stock 74</u>	FLYWHEEL TYPE <u>OEM, new thrust washers</u>
ENGINE NOTES: <u>New 3-hole crank pin, forged pistons,</u> <u>pinion race in case was trashed</u>		ROD TYPE <u>OEM w/ new races</u>
		ROD CAGES <u>alloy</u>

STEP 1

FRONT PISTON WEIGHTS	
PISTON	<u>426 g</u>
WRIST PIN	<u>96 g</u>
CLIPS	<u>2 g</u>
RINGS	<u>37</u>
TOTAL	<u>561 g</u>
REAR PISTON WEIGHTS	
PISTON	<u>426</u>
WRIST PIN	<u>96</u>
CLIPS	<u>2</u>
RINGS	<u>37</u>
TOTAL	<u>561</u>
TOTAL OF BOTH PISTONS <u>1122 g</u>	

STEP 2

ROTATING WEIGHTS	
CRANK PIN	<u>523</u>
NUTS	<u>94</u>
BEARING CAGES	<u>28</u>
BEARING ROLLERS	<u>69</u>
NUT LOCKS & SCREWS	<u>16</u>
TOTAL	<u>730 g</u>

STEP 3

FRONT ROD WEIGHTS	
WP END	<u>219</u>
CP END	<u>315</u>
TOTAL	<u>534</u>
ACTUAL WEIGHT (SHOULD MATCH TOTAL)	<u>534 g</u>
REAR ROD WEIGHTS	
WP END	<u>206</u>
CP END	<u>479</u>
TOTAL	<u>685</u>
ACTUAL WEIGHT (SHOULD MATCH TOTAL)	<u>685 g</u>

STEP 4

TOTAL RECIPROCATING WEIGHT	
TOTAL OF BOTH PISTONS (FROM STEP 1)	<u>1122</u>
WP END OF FRONT ROD (FROM STEP 3)	<u>219</u>
WP END OF REAR ROD (FROM STEP 3)	<u>206</u>
TOTAL RECIPROCATING WEIGHT	<u>1547 g</u>

STEP 5

TOTAL ROTATING WEIGHT	
TOTAL OF CRANK PIN WEIGHTS (FROM STEP 2)	<u>730</u>
CP END OF FRONT ROD (FROM STEP 3)	<u>315</u>
CP END OF REAR ROD (FROM STEP 3)	<u>479</u>
TOTAL ROTATING WEIGHT	<u>1524 g</u>

STEP 6

BALANCED RECIPROCATING WEIGHT	
TOTAL RECIPROCATING WEIGHT (FROM STEP 4)	<u>1547</u>
MULTIPLY BY BALANCE FACTOR	<u>x 0.6</u>
EQUALS BALANCED RECIPROCATING WEIGHT	<u>928.2 g</u>

STEP 7

BOBWEIGHT CALCULATION	
BALANCED RECIPROCATING WEIGHT (FROM STEP 6)	<u>928.2</u>
PLUS TOTAL ROTATING WEIGHT (FROM STEP 5)	<u>+ 1524</u>
EQUALS TOTAL BOBWEIGHT	<u>2452.2</u>
DIVIDE BY 2	<u>/2</u>
EQUALS BOBWEIGHT FOR EACH FLYWHEEL	<u>1226 g</u>

FLYWHEEL BALANCE SHEET

(WEIGHTS IN GRAMS)



OWNER'S NAME: _____

DATE: _____

ENGINE INFO

YEAR & TYPE OF ENGINE		PISTON TYPE:
BORE	STROKE	FLYWHEEL TYPE
ENGINE NOTES:		ROD TYPE
		ROD CAGES

STEP 1

FRONT PISTON WEIGHTS	
PISTON	_____
WRIST PIN	_____
CLIPS	_____
RINGS	_____
TOTAL	_____
REAR PISTON WEIGHTS	
PISTON	_____
WRIST PIN	_____
CLIPS	_____
RINGS	_____
TOTAL	_____
TOTAL OF BOTH PISTONS	

STEP 2

ROTATING WEIGHTS	
CRANK PIN	_____
NUTS	_____
BEARING	_____
CAGES	_____
BEARING	_____
ROLLERS	_____
NUT LOCKS	_____
& SCREWS	_____
TOTAL	_____

STEP 3

FRONT ROD WEIGHTS	
WP END	_____
CP END	_____
TOTAL	_____
ACTUAL WEIGHT	_____
(SHOULD MATCH TOTAL)	_____

REAR ROD WEIGHTS	
WP END	_____
CP END	_____
TOTAL	_____
ACTUAL WEIGHT	_____
(SHOULD MATCH TOTAL)	_____

STEP 4

TOTAL RECIPROCATING WEIGHT	
TOTAL OF BOTH PISTONS	_____
(FROM STEP 1)	
WP END OF FRONT ROD	_____
(FROM STEP 3)	
WP END OF REAR ROD	_____
(FROM STEP 3)	
TOTAL RECIPROCATING	_____
WEIGHT	

STEP 5

TOTAL ROTATING WEIGHT	
TOTAL OF CRANK PIN WEIGHTS	_____
(FROM STEP 2)	
CP END OF FRONT ROD	_____
(FROM STEP 3)	
CP END OF REAR ROD	_____
(FROM STEP 3)	
TOTAL ROTATING WEIGHT	_____

STEP 6

BALANCED RECIPROCATING WEIGHT	
TOTAL RECIPROCATING	_____
WEIGHT	
(FROM STEP 4)	
MULTIPLY BY BALANCE	_____
FACTOR	x 0.6
EQUALS BALANCED	
RECIPROCATING WEIGHT	_____

STEP 7

BOBWEIGHT CALCULATION	
BALANCED RECIPROCATING	_____
WEIGHT	
(FROM STEP 6)	
PLUS TOTAL ROTATING WEIGHT	_____
(FROM STEP 5)	
	+
EQUALS TOTAL BOBWEIGHT	_____
DIVIDE BY 2	/2
EQUALS BOBWEIGHT FOR EACH	
FLYWHEEL	_____